

5 [Effect of the invention]

As described above, according to claim 1 of the present invention, the plurality of ribs on the cover are crushed at the time of a vehicle collision, so that an impact is absorbed, and the breakage of the cover except the ribs is prevented.

10 Therefore, the electrodes of the batteries, the bus bars, the terminals and so on within the cover are protected from the external force or impact. Particularly, the externally-threaded-type electrodes of the batteries will not break through the cover, and therefore the short-circuiting of the batteries is avoided.

15 And besides, the plurality of ribs are provided instead of increasing the wall thickness of the cover as in the conventional structure, and therefore the cover has a lightweight design, and the resin molding of the cover is easy, and the cover is produced at low costs.

20 [0045]

According to claim 2 of the present invention, the plurality of ribs are arranged parallel to one another, and therefore an impact is absorbed efficiently, and the transmission of the impact to the parts within the cover is suppressed more effectively.

25 [0046]

According to claim 3 of the present invention, an impact, applied in every direction (for example, an impact applied obliquely to the rib), can be efficiently absorbed, and the parts within the cover is more positively protected.

30 [0047]

5        According to claim 4 of the present invention, at the time  
of a vehicle collision, the projection on the cover abuts against  
the fixing member, mounted on the electrode, and is deformed,  
that is, bent or crushed, thereby absorbing an impact, so that  
the electrode is prevented from breaking through the cover.  
10      The projections are provided instead of increasing the wall  
thickness of the cover as in the conventional structure, and  
therefore the cover has a lightweight design, and the resin molding  
of the cover is easy, and the cover is produced at low costs.  
[0048]

15      According to claim 5 of the invention, the projections have  
an annular shape, and therefore the projection is spread outwardly  
or compressed uniformly upon application of an impact, thereby  
absorbing the impact more efficiently. Therefore, adverse effects  
on the interior of the cover are further reduced. The distal  
20     end portion of the electrode is received in the annular projection,  
and therefore the protection and insulation of the electrodes  
are enhanced both before and after a collision.

[0049]

According to claim 6 of the present invention, the gap between  
25     the projection and the fixing member is smaller than the gap  
between the electrode and the cover. Therefore, the projection  
first abuts against the fixing member to absorb an impact, so  
that the distal end of the electrode strikes against the cover  
with a weakened force, or hardly comes into contact with the  
30     cover. As a result, the electrode is positively protected, and

5 the electrode is positively prevented from breaking through the  
cover. Therefore, the short-circuiting at the time of a collision  
is positively prevented.

[0050]

According to claim 7 of the present invention, at the time  
10 of a vehicle collision, an impact is more positively absorbed  
by the synergetic effect of the ribs and the projection, and  
therefore the protection of the parts within the cover is achieved  
more positively. The ribs and the projections are formed on  
the cover, and therefore the cover has a lightweight design as  
15 compared with the conventional structure in which the cover has  
an increased wall thickness. And besides, the molding of the  
cover is easy, and the cost of the cover is produced at low costs.

[0051]

According to claim 8 of the invention, the ribs and the  
20 projections are disposed generally symmetrically with respect  
to the plane of the cover. Therefore, at the time of a collision,  
an impact can be positively absorbed simultaneously by the ribs  
and the projection, and the protection of the interior of the  
cover is achieved more positively.

[0052]

According to claim 9 of the present invention, the plurality  
of ribs are interconnected by the bulge portions, and therefore  
the bending strength of the ribs increases, and the ribs will  
not be bent, but are properly crushed at the time of a collision.  
30 Even when an impact is applied in an oblique direction, the

5        ribs will not be bent, but are properly compressed (crushed),  
and an impact in every direction can be dealt with. The bulge  
portion is crushed together with the ribs, and therefore the  
shock-absorbing force is enhanced, and a higher impact can be  
dealt with.

10      [0053]

According to claim 10 of the present invention, the bulge  
portions can be crushed together with the ribs to absorb the  
impact more effectively.

15      [BRIEF DESCRIPTION OF THE DRAWINGS]

Fig. 1 is a partly cross-sectional, perspective view of  
a shock-absorbing structure of a battery cover forming a first  
embodiment of the present invention;

20      Fig. 2 is a perspective view showing a condition in which  
the cover has absorbed an impact;

Fig. 3 is a perspective view showing a shock-absorbing  
structure of a battery cover which is a modified form of the  
structure of Fig. 1;

25      Fig. 4 is an exploded, perspective view of a shock-absorbing  
structure of a battery cover forming a second embodiment of the  
present invention;

Fig. 5 is a cross-sectional view of the shock-absorbing  
structure of Fig. 4 in an assembled condition;

30      Fig. 6 is a plan view showing a condition in which a  
shock-absorbing projection interferes with a nut of the battery;

5           Fig. 7 is a cross-sectional view showing a condition in  
which an impact is absorbed;

Fig. 8 is a cross-sectional view showing a shock-absorbing  
structure of a battery cover forming a third embodiment of the  
present invention;

10          Fig. 9 is a perspective view showing a more specific form  
of shock-absorbing structure of the third embodiment;

Fig. 10 is a perspective view showing another more specific  
form of shock-absorbing structure of the third embodiment;

15          Fig. 11 is a perspective view showing a further more specific  
form of shock-absorbing structure of the third embodiment;

Fig. 12 is an exploded, perspective view showing a  
battery-connecting plate, including a conventional cover and  
a conventional casing, and a battery block;

20          Fig. 13 is an exploded, perspective view showing the other  
examples of a conventional cover and a conventional casing; and

Fig. 14 is a cross-sectional view of the structure shown  
in Fig. 13 in an assembled condition, and illustrates a problem  
thereby.

[Description of Reference numerals]

25          1, 3, 8, 18, 25, 38, 50: cover

2, 4, 5, 19, 31, 43, 52: rib

9, 56: case

10: electrode

11: nut (fixing member)

30          14, 20: projection

5 21, 33, 44, 53: bulge portion

S1, S2: gap